

CLAIMS

What is claimed is:

1. A dynamic seal assembly for installation between first and second relatively rotating members, said assembly comprising:

a ring for fixed engagement with said first member and an annular seal extending radially from said ring and configured to slidably engage said second member, wherein said radial seal has a thickness, and a length that is from about 1 to about 15 times greater than said thickness.

2. A dynamic seal assembly according to Claim 1, wherein said length is from about 5 to about 15 times greater than said thickness.

3. A dynamic seal assembly according to Claim 2, wherein said length is from about 5 to about 12 times greater than said thickness.

4. A dynamic seal according to Claim 1, wherein said radial seal is comprises a cured fluorocarbon elastomer dispersed in a matrix comprising a thermoplastic material.

5. A dynamic seal according to Claim 4, wherein said cured fluorocarbon elastomer is present as a discrete phase or a phase co-continuous with said matrix, and wherein said radial seal has a tan-delta of less than 1.0.

6. A dynamic seal according to Claim 4, wherein the radial seal is made by a process comprising the step of dynamically vulcanizing a fluorocarbon elastomer in the presence of a thermoplastic material.

7. A dynamic seal according to Claim 4, wherein the hardness of said annular seal is Shore A 50 or greater, the tensile strength of the seal is 4 MPa or greater, the modulus at 100% of the article is at least about 4 MPa, and the elongation at break of the article is 10% or greater.

8. A dynamic seal according to Claim 4, wherein said cured fluorocarbon elastomer is present at a level of at least about 35% by weight based on the total weight of said cured fluorocarbon elastomer and said thermoplastic polymer.

9. A dynamic seal according to Claim 8, wherein said cured fluorocarbon elastomer is present at a level of at least about 50% by weight based on said total weight.

10. A dynamic seal according to Claim 4, wherein said thermoplastic material is a thermoplastic elastomeric material comprising an amorphous polymer having a glass transition temperature of at least about -40°C.

11. A dynamic seal according to Claim 4, wherein said thermoplastic material is a reactive oligomer material which comprises a semi-crystalline polymer having a melting point of at least about 80°C.

12. A dynamic seal according to Claim 4, wherein said fluorocarbon elastomer is selected from the group consisting of VDF/HFP, VDF/HFP/TFE, VDF/PFVE/TFE, TFE/Pr, TFE/Pr/VDF, TFE/Et/PFVE/VDF, TFE/Et:PFVE, TFE/PFVE; and mixtures thereof.

13. A dynamic seal according to Claim 1, wherein said radial seal is made by a process comprising the steps of:

- (a) combining an uncured or partially cured fluorocarbon elastomer, a curative agent capable of reacting with the fluorocarbon elastomer to effect cure, and a thermoplastic material;
- (b) mixing the combination;
- (c) applying heat to the combination during the mixing step; and
- (d) forming the seal by subjecting the composition to one of blow molding, compressive molding, injection molding, or extrusion.

14. A dynamic seal according to Claim 1 wherein the radial seal is made by a process comprising made by a process comprising the steps of:

- (a) mixing the elastomer and thermoplastic components in the presence of the curative agent;
- (b) heating during mixing to effect cure of the elastomeric components; and
- (c) injection molding the composition.

15. A dynamic seal according to Claim 1, wherein said first member is a housing, and said second member is a rotating shaft.

16. A method for making a dynamic seal comprising:

- (a) forming a mixture by combining a curative, an uncured or partially cured elastomeric material, and a thermoplastic material; and
- (b) heating the mixture at a temperature and for a time sufficient to effect vulcanization of the elastomeric material, wherein mechanical energy is applied to mix the mixture during the heating step; wherein the elastomeric material comprises a fluorocarbon elastomer; and wherein the thermoplastic material comprises a non-fluorine-containing polymeric material; and
- (c) injection molding the mixture.

17. A method according to Claim 16, wherein said fluorocarbon elastomer is selected from the group consisting of: VDF/HFP, VDF/HFP/TFE, VDF/PFVE/TFE, TFE/Pr, TFE/Pr/VDF, TFE/Et/PFVE/VDF, TFE/Et:PFVE, TFE/PFVE; and mixtures thereof.

18. A dynamic seal assembly for installation between an inner rotating shaft and an outer housing comprising:

an annular radial seal extending from said non-rotating housing into sliding contact with said shaft, said annular radial seal being configured to slidably engage said shaft, said radial seal having a thickness, and a length which is from about 1 to about 15 times greater than said thickness, said annular radial seal further comprising a flat bearing surface which contacts the rotating shaft.

19. A dynamic seal assembly according to Claim 18, wherein said length is from about 5 to about 15 times greater than said thickness.

20. A dynamic seal assembly according to Claim 19, wherein said length is from about 5 to about 12 times greater than said thickness.

21. A dynamic seal according to Claim 18 wherein said flat bearing surface comprises a variegated surface.

22. A dynamic seal according to Claim 21, wherein said variegated surface is a helical spiral groove.

23. A dynamic seal according to Claim 18, wherein said annular seal comprises a reinforcing bead.

24. A dynamic seal according to Claim 18, wherein said annular seal comprises a pair of suspension flanges and a spring disposed between the suspension flanges.

25. A dynamic seal according to Claim 18, wherein the annular seal is formed of a material having a tangent delta of less than about 1.0.

26. A dynamic seal according to Claim 18, wherein said annular seal is formed of a material having a ratio of loss modulus to storage modulus which is less than about 0.1.